DRAFT

# TECHNICAL MEMORANDUM

**Project:** **Issaquah School District – HS #4 / ES #17**

**Subject:** Potential Neighborhood Traffic Calming Measures

**Date:** May 10, 2021

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## 1. Project Background and Analysis Purpose

The Issaquah School District (ISD) proposes to co-locate a new elementary school (serving grades pre-kindergarten through 5) and a new high school (serving grades 9 through 12) on property located west of 228th Avenue SE and north of SE 43rd Way. The site is located within the City of Issaquah, but is at the boundary with the City of Sammamish. The main site access driveway on 228th Avenue SE would be within the City of Sammamish's jurisdiction.

The potential transportation impacts of the project are detailed in *Transportation Technical Report (REVISED) for High School #4 / Elementary School #17*.[1] That study determined that the project would adversely affect the near-site intersection at 228th Avenue SE / SE 40th Street, which is currently unsignalized with a stop sign controlling the minor leg (SE 40th Street). The original *Transportation Technical Report*[2] had recommended installing a traffic signal at that intersection. However, that option was not favored by the City of Sammamish because it could attract additional cut-through traffic to SE 40th Street. The revised report evaluated an alternative "Flying T" configuration that would retain the stop-sign but reconfigure the intersection to reduce delays for left turns from the stop-controlled approach. That option also has disadvantages in that it does not provide a controlled pedestrian crossing of 228th Avenue SE (as a traffic signal would). Pedestrians could walk along the east side of 228th Avenue SE and cross at the new school's driveway, which would be signalized.

Through discussions with City of Sammamish traffic review staff, a traffic signal at the SE 40th Street/ 228th Avenue SE intersection may be acceptable if additional measures are provided to discourage and/or slow traffic that may cut through the Sammamish Highlands neighborhood to reach the signal. There are many ways to calm traffic on neighborhood streets, which are described in Section 2 below. There are benefits and disadvantages to various measures depending on the characteristics of the street and/or system of streets in which they are deployed. Section 3 describes the characteristics of the streets in the subject neighborhood, and Section 4 presents the City of Sammamish's estimate of potential cut-through traffic volume. The information about the devices, street characteristics, and cut through traffic volume estimates were then used to develop a recommendation, which is presented in Section 5.

## 2. Traffic Calming Devices

According to *Traffic Calming, State of the Practice*:[3]

1 Heffron Transportation, Inc., February 16, 2021.
2 Heffron Transportation, Inc., September 1, 2020.
3 Ewing, Reid. Institute of Transportation Engineers and the US Department of Transportation, August 1999.

> "*Traffic calming is the combination of mainly physical measures that reduce the negative effects of motor vehicle use, alter driver behavior and improve conditions for non-motorized street users. Unlike other traffic control devices such as stop signs and speed limit signs, which are regulatory measures, traffic calming devices are intended to be self-enforcing.*"

Cities throughout the Puget Sound region, particularly the City of Seattle, were pioneers in the development and use of neighborhood traffic calming devices. Many neighborhood traffic control devices deployed in the 1970s in Seattle's Capitol Hill neighborhood to thwart cut-through traffic between downtown and the State Route 520 floating bridge are still in place and continue to effectively reducing cut-through traffic. More recently, Seattle and other local cities have successfully implemented smaller, less-expensive devices, such as speed humps and chicanes, on streets that have no curbs or sidewalks. These agencies have provided a resource to observe the use, benefits, and negative effects associated with various types of devices. Information about potential traffic calming devices was obtained from a City of Seattle report, *Making Streets That Work* (May 1996). This information was augmented with information from *Traffic Calming, State of the Practice.* The sections below describe various measures and where they could or should not be used.

## 2.1. Speed Humps

Speed humps are raised mounds of pavement approximately 3-inches high that extend the width of the street. Unlike speed bumps (the type often found in private parking lots), speed humps have a lower slope and do not "jolt" a vehicle as severely as a speed bump. They are typically used in tandem or groups spaced at about 400-foot intervals to slow traffic over the length of a roadway. When used on a curb-less street, the hump should extend to the edge of the pavement to prevent vehicles from maneuvering around the end of the device.

Speed humps are generally not used on steep grades because of their ability to "launch" downhill traffic and stall uphill traffic. Such a device on a steep grade can also create issues with control when the roadway is covered with ice or snow. Speed humps are also difficult to maneuver on a bicycle or motorcycle. Finally, because they slow emergency vehicle access, and are disliked by the fire department, they are not used unless 85% of the traffic is traveling at speeds of 35 miles per hour (mph) or greater on a residential street, and the traffic volumes are greater than 400 vehicles per day. Some speed hump installations retain gaps at the width of a fire trucks wheels to better accommodate emergency vehicles.

## 2.2. Speed Cushions

A speed cushion is a modified speed hump with channels cut down the middle. They are designed so that fire trucks can straddle a cushion and avoid the bump. In doing so, the emergency response vehicles avoid the delays caused by conventional speed humps.
Speed cushions have been used in Great Britain for many years and are now gaining popularity throughout the U.S. The City of Bellevue has installed speed cushions along 164$^{th}$ Avenue NE to reduce cut-thru traffic in the Bel-Red neighborhood. One issues with speed cushions on curb-less streets is that motorists may veer into the shoulder area to avoid them.

## 2.3. Traffic Circles

Traffic circles have a long history of use by the City of Seattle with high benefit and very few negative effects. Traffic circles are raised islands constructed at intersections that cause motorists to decrease speed in order to maneuver around the circle. Traffic circles are also very effective at reducing angle accidents at intersections, by slowing drivers down and drawing their attention to the intersection. The

Seattle Department of Transportation (SDOT) documented a decrease in accidents of about 90% at intersections where traffic circles have been installed.

Past studies have shown that traffic circles are effective at reducing speeds along the approaching streets. However, this speed reduction tends to be limited to the immediate vicinity of the traffic circle. If speed reduction is desired along the length of a street, traffic circles at adjacent intersections should be considered. Traffic circles usually do not divert traffic to other streets, which is another benefit of this device. Traffic circles are less effective at reducing speeds when there is no curb to define the intersection. At T-intersections (three-legged intersections), a traffic circle is often combined with small curb-side islands on the straight side of the intersection to improve their effectiveness.

## 2.4. Chicanes

Chicanes are usually constructed as a set of two or three closely spaced curb bulbs on alternating sides of the street that narrow a roadway to one lane of traffic and force drivers to perform S-turns to maneuver through them. This substantially reduces traffic speeds through the chicane. Some of the negative effects of chicanes are that they can cause traffic to divert to parallel streets and eliminate some on-street parking. Chicanes are not used if they would block driveways, are located on a steep grade that could cause maneuvering difficulties in ice or snow, or would be along a transit route or a major emergency access route.

## 2.5. Curb Bulbs

Curb bulbs extend the sidewalk into the street. In most cases, these are used to enhance pedestrian conditions by shortening the street-crossing distance and improving visibility between a pedestrian and an approaching motorist. They also prevent vehicles from parking too close to an intersection, which can block sight lines or curb ramps. As a traffic control device, curb bulbs can reduce speeds by narrowing the roadway. Less expensive curb bulbs that construct a small island adjacent to the curb have also been used. This eliminates the need to remove the existing curb, and can also reduce the need to change a street's drainage and/or gutter system. Curb bulbs should not be used at intersections where a large curb radius is needed for transit and/or truck traffic, or where the curb lane is needed for vehicular capacity (e.g., peak hour parking restrictions, auxiliary turn lane, or on an arterial that could need additional travel lanes in the future). Curb bulbs can create maneuvering difficulties for bicyclists.

## 2.6. Choker

A choker is a set of two curb bulbs that extend into the street near an intersection to narrow the street and cause motorists to slow down when entering and leaving the street. Such a device is used to reduce a high volume of cut-through traffic, reduce speeds, and to protect a residential street from traffic associated with an adjacent commercial area. They should not be used on narrow streets (less than 25 feet), where traffic could be diverted onto another residential street, or near arterial intersections.

## 2.7. Traffic Diverters

Traffic diverters are used on streets with high volumes of cut-through traffic. They are usually implemented by constructing an island that connects from corner to corner at an intersection. This forces traffic to turn at the intersection and prohibits through traffic. Traffic diverters should not be used if it would divert traffic onto other residential streets, or if the street is a major emergency or school bus route.

## 2.8. Partial Street Closure

A partial street closure is usually implemented with a curb bulb on one side of the street that physically blocks one direction of traffic. This measure is usually implemented adjacent to an intersection and includes signage and striping (e.g., "Do Not Enter") to indicate the closure to one direction of travel. Although only one direction of traffic would be allowed at that location, two-way traffic could be permitted along the remainder of the street. This device may be used if a street has a high volume of cut-through traffic. It would not be used if it would divert traffic onto other residential streets, or if the street is a major emergency or school bus route.

## 2.9. Summary of Various Traffic Control Devices

Table 1 summarizes the various traffic control devices that can be used to calm traffic on neighborhood streets along with benefits and locations or conditions where they should not be used.

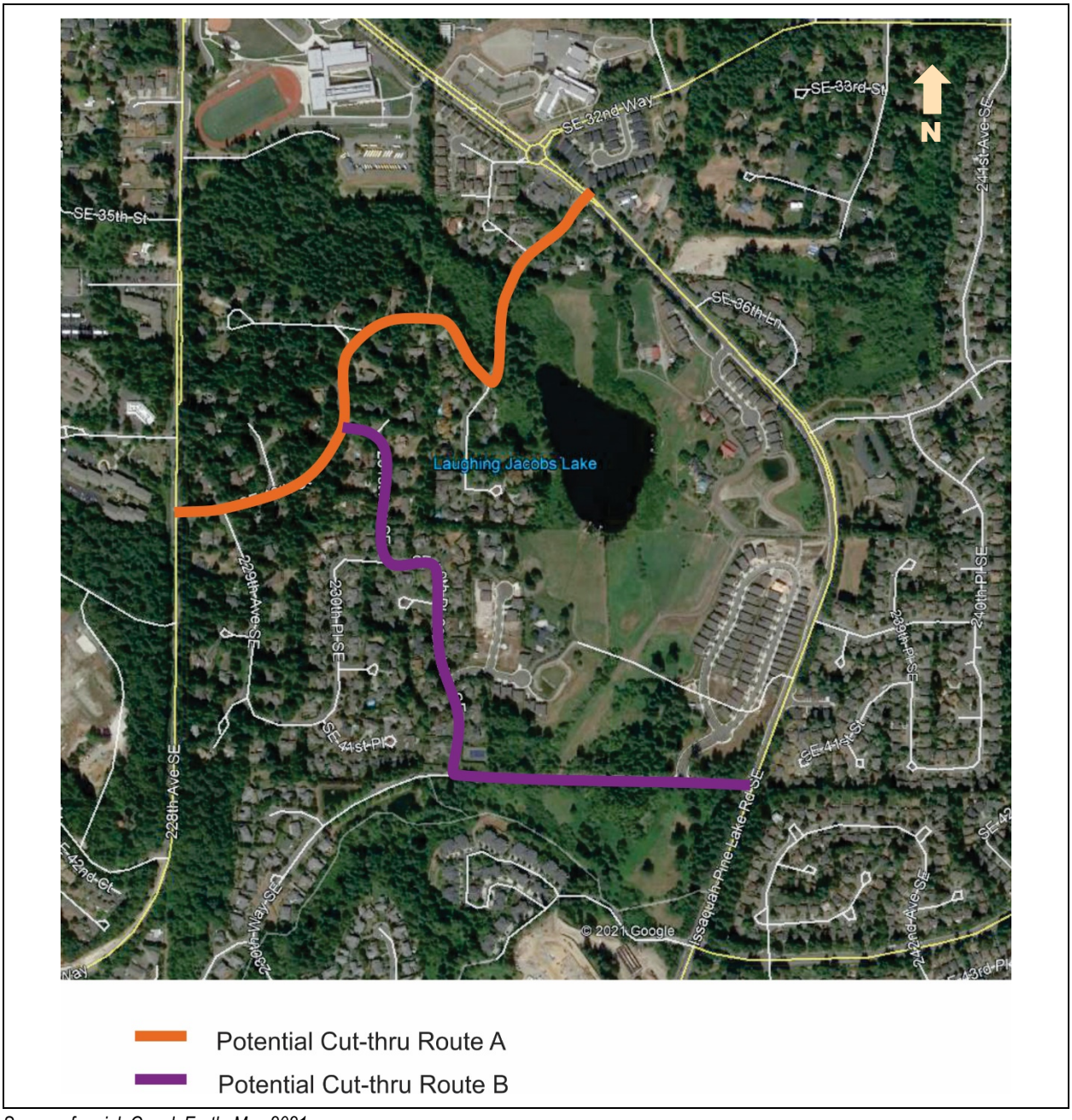
Table 1. Summary of Neighborhood Traffic Control Devices

| Type of Device | Benefits of Device | | | Do Not Use If | | |
|---|---|---|---|---|---|---|
| | Speed Reduction | Accident Reduction | Traffic Reduction | Diverts traffic to other local streets | Located on steep grade | On emergency or bus route |
| Speed Humps | ✓ | | ✓ | | ✓ | |
| Speed Cushions | ✓ | | ✓ | | ✓ | |
| Traffic Circles | ✓ | ✓ | | | | |
| Chicanes | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Curb Bulbs | ✓ | | | | | |
| Choker | ✓ | | ✓ | ✓ | | ✓ |
| Traffic Diverter | ✓ | ✓ | ✓ | ✓ | | ✓ |
| Partial Street Closure | | | ✓ | ✓ | | ✓ |

## 3. Characteristics of Neighborhood Cut-Through Routes

SE 40th Street is the western access to the Sammamish Highlands neighborhood. There are two routes that connect between 228th Avenue SE on the west and Issaquah-Pine Lake Road SE on the east side of the neighborhood, which are shown as Route A and Route B on Figure 1. Route A follows SE 40th Street, and Route B winds through the neighborhood to SE 42nd Street. There are several longer routes that connect to arterials further south, but they are so circuitous that they are unlikely to be used by cut-through traffic. Therefore, this analysis and potential solutions focus on the more direct Routes A and B.

Figure 1. Potential Cut-Through Traffic Routes of Sammamish Highlands Neighborhood




*Source of aerial, GoogleEarth, May 2021.*

**Potential Cut-Through Route A** is approximately 3,500 feet in length, and uses SE 40th Street, SE 37th Street, and 234th Avenue SE. West of 232nd Avenue SE, both SE 40th and SE 37th Streets are 28-feet to 32-feet wide from edge to edge. However, a white "fog-line" stripe has been painted to delineate a shoulder/walkway area on one side of the streets, which is typically 5-feet to 8-feet wide. These segments haves no curbs or gutters.

The short segment of SE 37th Street between 232nd Avenue SE and 234th Avenue SE has a rolled-asphalt curbs and gutters on both sides of the street, with a sidewalk on the south side of the street. The pavement between the curbs is about 24-feet wide.

East of SE 37th Street, 234th Avenue SE passes through a greenbelt area that is signed as a "Stormwater Facility." The pavement in this area is about 28-feet wide but has no edge striping. It also has no formal curb; instead, the edge has been sloped to create a shallow gutter. The cross-section changes again about 150 west of SE 35th Street where it has a 24-foot-wide travel way with rolled-asphalt curbs on both sides and a sidewalk on the north side of the street. There is a fire station on the northwest corner of the Issaquah-Pine Lake Road / 24th Avenue SE intersection.

There is no striped centerline along the entire route, so motorists often drive down the center of the roadway until moving to the side when encountering oncoming traffic. Between the two end points of this route there is only one traffic control device—a stop sign for eastbound SE 37th Street traffic at the 234th Avenue SE intersection. Westbound traffic on this route has no controls. Although there are no posted parking restrictions, no vehicles were observed parked on street. The posted speed limit is 25 mph.

If this route were used to avoid using Issaquah-Pine Lake Road and 228th Avenue SE to reach the school, it would reduce the length of the trip by about 2,300 feet (less than ½-mile) and allow drivers to avoid three major intersections: the roundabout at Issaquah-Pine Lake Road / SE 32nd Way, the traffic signal at Issaquah-Pine Lake Road SE / Pine Lake Middle School, and the major intersection at Issaquah-Pine Lake Road SE / 228th Avenue SE.

**Potential Cut-Through Route B** is about 4,900 feet in length and uses portions of SE 40th Street, 231st Avenue SE, SE 40th Place, 232nd Avenue SE, and SE 42nd Street. The SE 40th Street conditions were described above. 231st Avenue SE has about 22-feet of pavement with narrow striped shoulders on both sides of the street. The vehicular travel way width between the edge stripes is about 20 feet. SE 40th Place and 232nd Avenue SE have rolled-asphalt curbs on both sides of the street with a sidewalk on one side of the street. The width between the curbs is approximately 28 feet. SE 42nd Street has a vertical curb and sidewalk on the north side of the street and a striped 5-foot shoulder on the south side of the street. The travel way is about 22-feet wide.

This route has more stop signs than Route A. There are stop signs for southbound traffic on 231st Avenue SE at SE 40th Place and on southbound 232nd Avenue SE at SE 42nd Street. The Issaquah-Pine Lake Road / SE 42nd Street intersection is signalized. There is no striped centerline on any of the streets. The posted speed limit is 25 mph.

Compared to the arterial route described above, this route would reduce the length of a trip by about 4,500 feet (just less than a mile) in travel distance and avoid the same three major intersections as described for Route A.

## 4. Potential Cut-Thru with New Traffic Signal

The City of Sammamish has retained the consulting firm Transportation Solutions, Inc. (TSI) to review the school's transportation impact analysis. As part of that effort, TSI staff utilized the City's "pipeline travel demand model" to assess how much additional traffic could cut through the Sammamish Highlands neighborhood if the SE 40th Street / 228th Avenue SE intersection were signalized. The results of that independent analysis were presented in a memorandum from TSI, *Issaquah School District High School #4/Elementary School #17, Traffic Analysis Supplement.*[4] This report stated:

> "*Based on the pipeline travel demand forecast, signalization of 228th Ave SE & SE 40th St is anticipated to result in a net increase of approximately 67 non-Project westbound left-turn trips in the AM peak hour and 37 non-Project northbound right-turn trips in the PM peak hour at the intersection.*"

The school-related trips generated from within the Sammamish Highlands neighborhood are expected to occur without or with the proposed school project. If the new high school and elementary school are not built, students who live within this neighborhood would continue to use neighborhood streets to reach an alternative school location.

## 5. Recommendations

Both Routes A and B use relatively narrow local streets that have several intersections along their lengths. These streets are not part of a larger grid, so there is little risk that traffic control devices would divert local traffic to a parallel neighborhood route. There are also several steep hills along both routes that would preclude use of some devices.

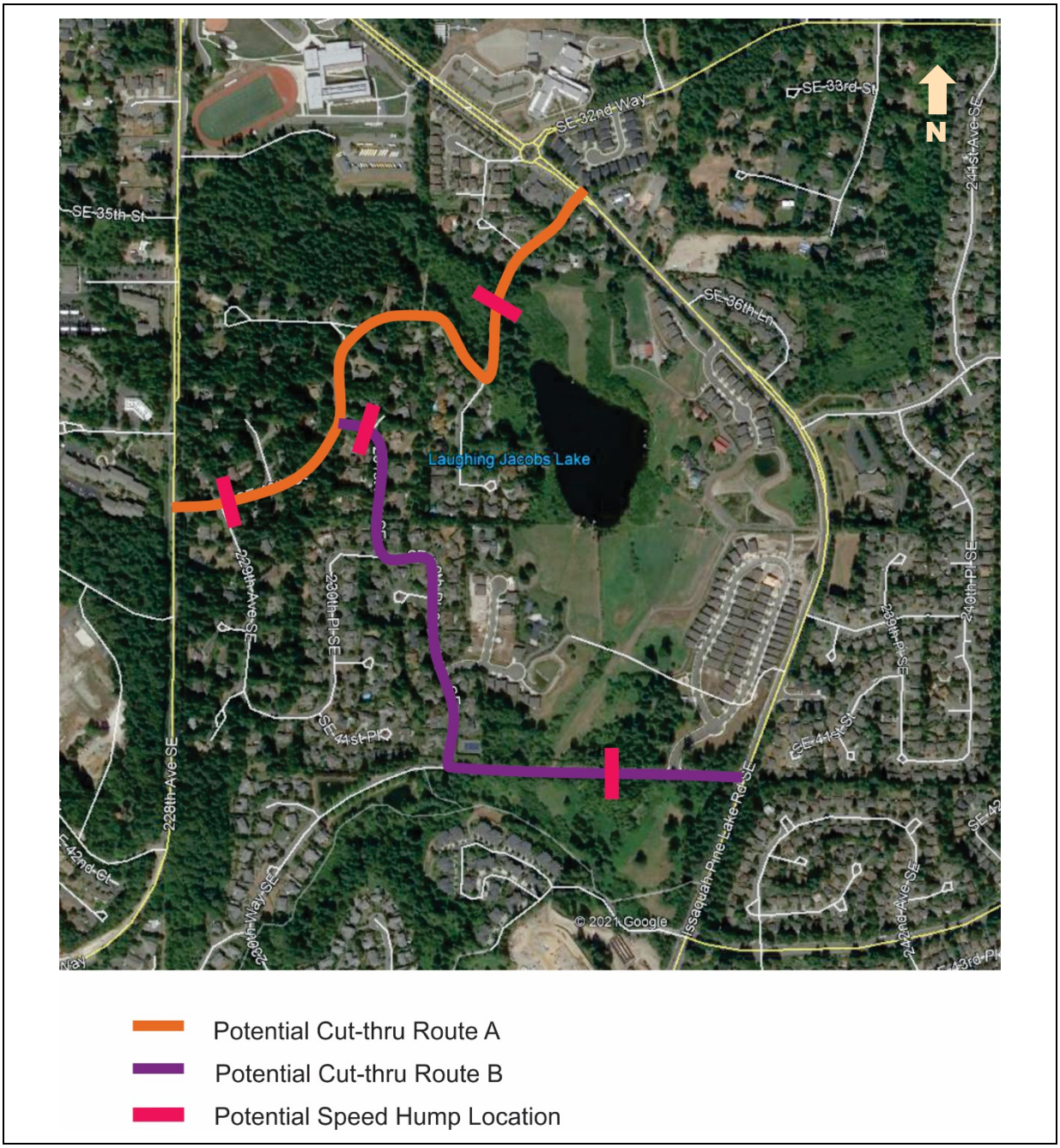
As described in the prior section, a new signal at the SE 40th Street / 228th Avenue SE intersection could attract up to 67 cut-through trips during the AM peak hour when school traffic is highest. While this traffic would be noticeable to those who live along the cut-through route, it is not at the level that would justify the most restrictive types of neighborhood traffic control devices—chicanes, partial closures, or diverters—since those types of devices would greatly inconvenience those who live in the neighborhood 24 hours per day, 7 days per week. Given the volume of potential cut through traffic volume and the street characteristics, a system of speed humps is recommended along the segments of each route where there is no curb that narrows the street width. Studies have shown that motorists tend to drive faster on wider streets than on those that are narrower or perceived to be narrower. Along the two routes, the locations where curbs and sidewalk exist are also the areas where the housing density is highest, and the presence of driveways and mailboxes also helps to slow vehicular traffic.

Speed humps are recommended at each end of the two routes (four humps total) in locations where the roadway is relatively flat and removed from adjacent houses. Because the recommended locations are curb-less, speed humps rather than speed cushions are recommended since they can be extended to the edge of the pavement and reduce the ability of a motorist to swerve into the striped shoulder/walkway areas to avoid the device. The speed humps would indicate to motorists that they are driving through a residential neighborhood where speeds should be slow.

Figure 2 shows the potential location for speed humps along the corridor.

[4] Transportation Solutions, Inc., April 26, 2021.

Figure 2. Potential Location for Speed Humps in Sammamish Highlands Neighborhood




*Source of aerial, GoogleEarth, May 2021.*